Curious Dice Games

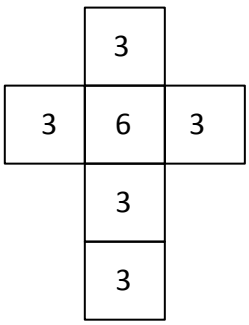
Task A

In class recently we claimed that, if I rolled the die below, and you roll it afterwards, the probability that I beat you is the same as the probability that you beat me.

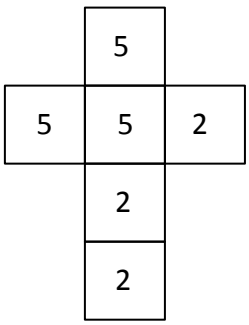
(i) What is the probability I beat you with my score?
(ii) What is the probability you beat me with your score?
(iii) What is the probability we tie?
(iv) What's a sensible way of checking our answers to the above questions?

Task B

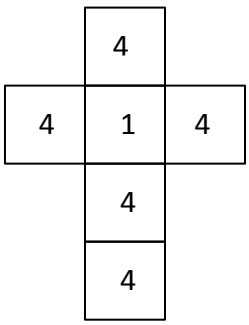
Then, we played with different dice – a Red one, a Blue one and a Black one. The nets for these dice are drawn below. Notice that the sum of the six numbers showing is always 21, as it is in a "standard" die.



RED



BLACK



BLUE

(i) Which die is more likely to win – Red or Blue? ***Prove*** your answer.
(ii) Which die is more likely to win – Red or Black? ***Prove*** your answer.
(iii) Which die is more likely to win – Black or Blue? ***Prove*** your answer.

What do you notice about the above answers?

Do your experimental results agree with the theory?

What if we brought back a standard die (numbers 1-6). Would this die be more likely to win or lose against the "coloured" dice above?

RED versus BLUE

		RED					
		3	3	3	3	3	6
BLUE	1						
	4						
	4						
	4						
	4						
	4						

BLUE wins are shaded blue, RED wins are shaded red

p(BLUE wins) = 25/36 p(RED wins) = 11/36 **So … BLUE beats RED**

RED versus BLACK

		RED					
		3	3	3	3	3	6
BLACK	2						
	2						
	2						
	5						
	5						
	5						

BLUE wins are shaded grey, RED wins are shaded red

p(BLACK wins) = 15/36 p(RED wins) = 21/36 **So … RED beats BLACK**

BLACK versus BLUE

		BLACK					
		2	2	2	5	5	5
BLUE	1						
	4						
	4						
	4						
	4						
	4						

BLACK wins are shaded grey, BLUE wins are shaded blue

p(BLACK wins) = 21/36 p(BLUE wins) = 15/36 **So … BLACK beats BLUE**

RED versus STANDARD

		RED					
		3	3	3	3	3	6
STANDARD	1						
	2						
	3						
	4						
	5						
	6						

BLUE wins are shaded blue, STANDARD wins are shaded GREEN (and ties are blank)

p(STANDARD wins) = 15/36 p(RED wins) = 15/36 **So … RED and STANDARD tie**

STANDARD versus BLUE

		STANDARD					
		1	2	3	4	5	6
BLUE	1						
	4						
	4						
	4						
	4						
	4						

STANDARD wins are shaded green, BLUE wins are shaded blue (and ties are blank)

p(STANDARD wins) = 15/36 p(BLUE wins) = 15/36 **So … BLUE and STANDARD tie**

STANDARD versus BLACK

		STANDARD					
		1	2	3	4	5	6
BLACK	2						
	2						
	2						
	5						
	5						
	5						

STANDARD wins are shaded green, BLACK wins are shaded grey (and ties are blank)

p(STANDARD wins) = 15/36 p(BLACK wins) = 15/36 **So … BLACK and STANDARD tie**